KING COUNTY CONVEYANCE SYSTEM IMPROVEMENT PROJECT

TASK 210

HIDDEN LAKE SERVICE AREA PLANNING RECORD SUMMARY

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TABLE OF CONTENTS

LIST OF FIGURES

INTRODUCTION

The results of our review of planning records for the Hidden Lake Service Area dating back to the 1958 Metropolitan Seattle Sewerage and Drainage Survey (1958 Plan) are presented in this memorandum. A description of the planning area and present conveyance issues is followed by a discussion of the development of wastewater services, the impacts of future growth and the implementation of the King County's Regional Wastewater Services Plan (RWSP).

General Planning Area Description

The Hidden Lake Service Area is located in Northwest King County in the city of Shoreline (Figure 1). The King County Wastewater Treatment Division (WTD), Shoreline Wastewater Management District (WMD), and Highlands Sewer District (SD) each own and maintain elements of the wastewater conveyance system within the service area. Because of the nature and scope of conveyance issues in the study area, the Hidden Lake Service Area has been defined to include areas draining to the Hidden Lake Pump Station and all areas contributing to wastewater flows in the King County conveyance system upstream of the Richmond Beach Pump Station (Figure 2).

King County WTD's Hidden Lake Pump Station, located at the intersection of NW Innis Arden Way and NW 167th Street receives wastewater flows from King County WTD and Shoreline WMD sewers. From areas north and east of the pump station, sanitary flows are carried by gravity sewers, intercepted by King County's Boeing Creek Trunk (NW 175th Street and 6th Avenue), and delivered to the pump station. Shoreline Pump Stations No. 4 and No. 5 also discharge to the Hidden Lake Pump Station. Shoreline Pump Station No. 5 receives most of its influent from the Highlands Sewer District. The total drainage area of the Hidden Lake Pump Station is 2.9 square miles (sq. mi.) (1,850 acres).

The Hidden Lake Pump Station has a documented firm pumping capacity of 4.2 mgd, but under actual operating conditions the capacity is probably closer to 3.8 mgd (Ed Cox, personal communication). An 18-inch diameter overflow line leads to Shoreline Pump Station No. 4 where wastewater can be temporarily stored, pumped back to the Hidden Lake Pump Station, or discharged 365 feet to a marine outfall. The Hidden Lake Pump Station discharges to a 2,375-foot long 14-inch diameter force main section of the Boeing Creek Trunk. Downstream of the force main, gravity sewers and a siphon carry wastewater flows to the Richmond Beach Pump Station. There are numerous interconnections between Shoreline WMD sewers and the gravity section of the Boeing Creek Trunk, adding flows to the system downstream of the Hidden Lake Pump Station.

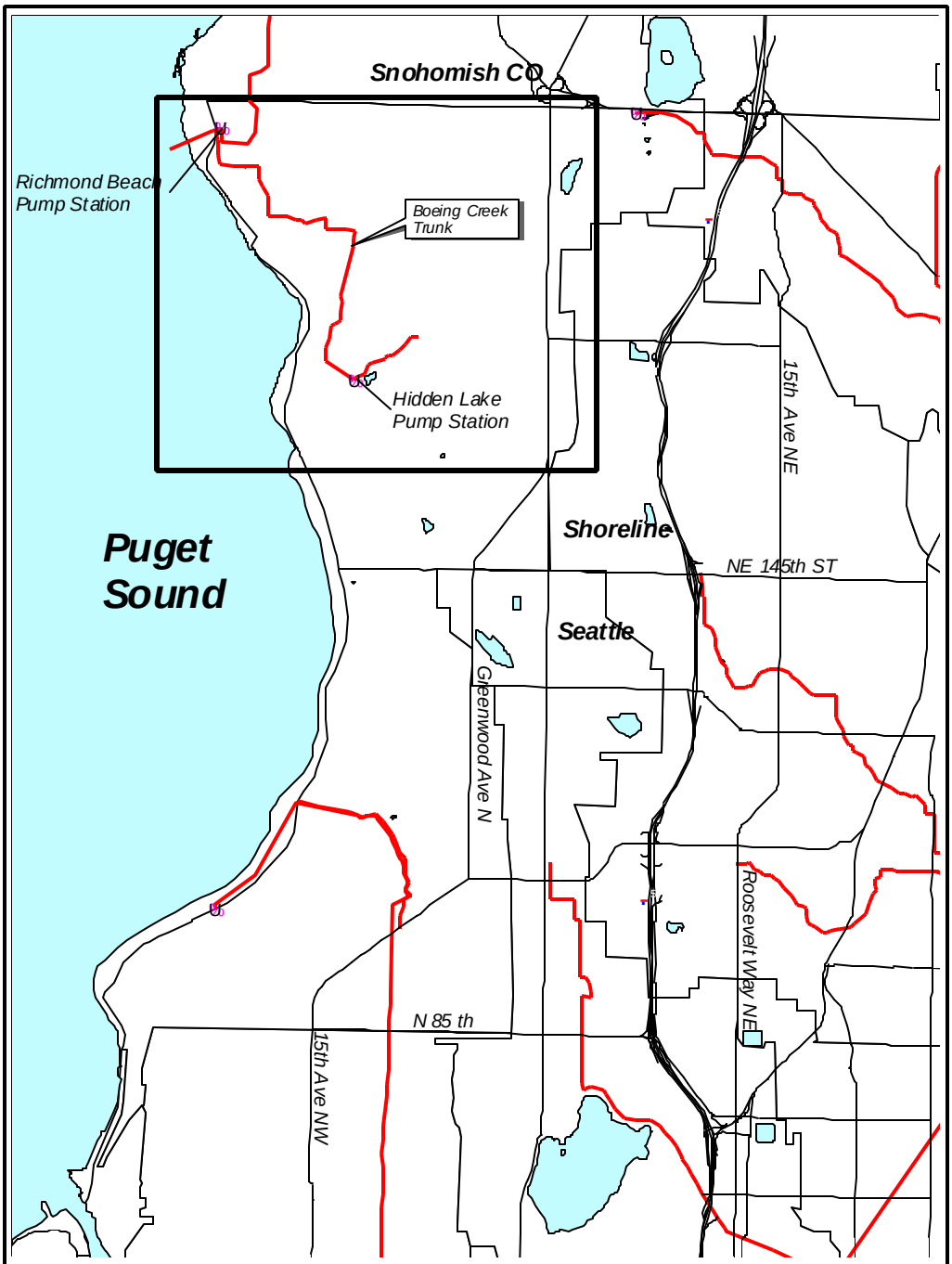

Figure 1: Hidden Lake Service Area Location and Vicinity Map

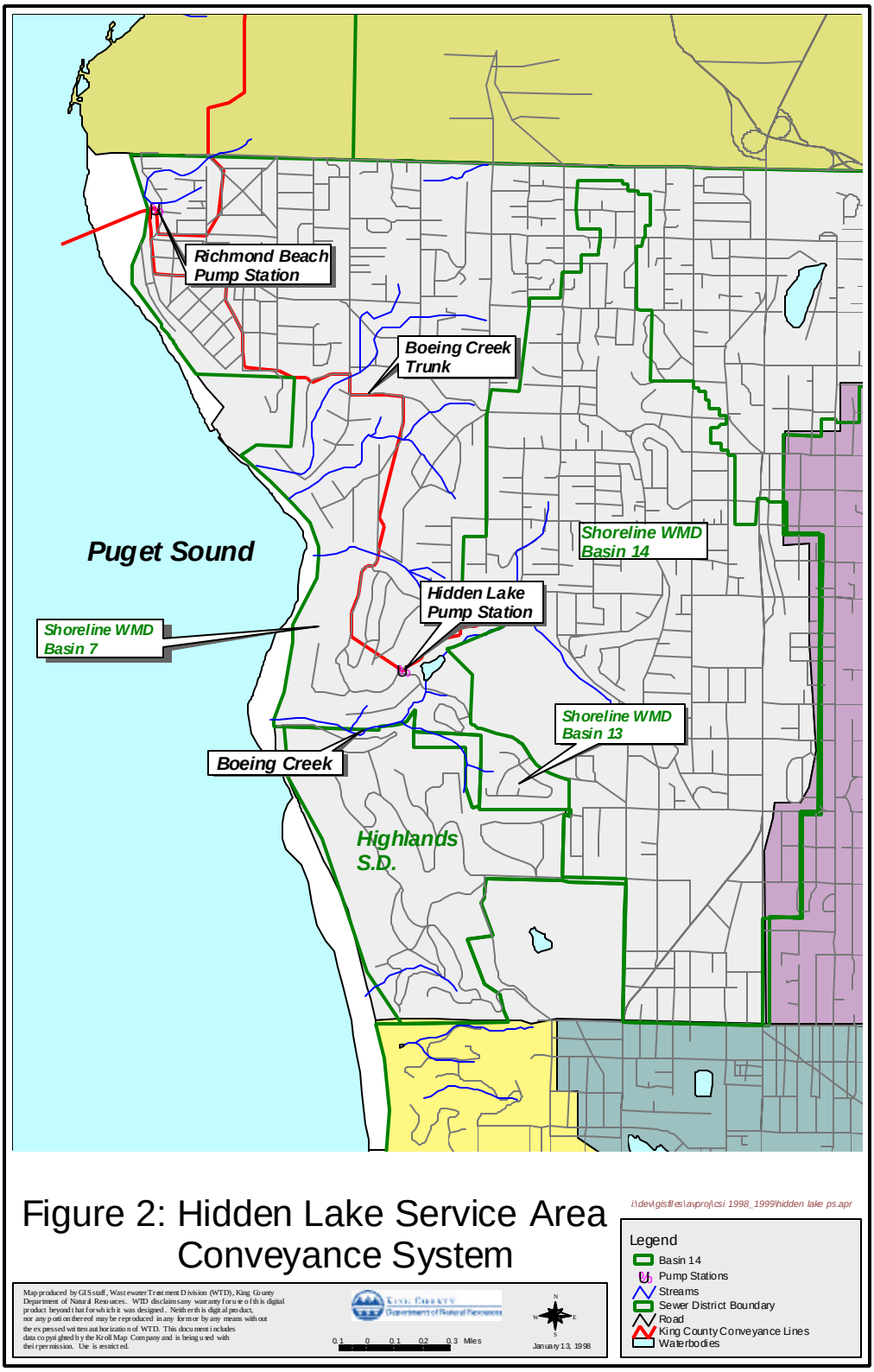

Figure 2: Hidden Lake Service Area Conveyance System

The Hidden Lake Service Area is largely developed and approximately 100 percent sewered with a separated system. Zoning is primarily single family residential, with a concentration of commercial development along Aurora Avenue. The current population is approximately 15,000 and the average annual growth rate has been two to three percent over the past 20 years. Without changes to the current zoning restrictions, the rate of population growth is expected to remain steady. There is potential for multi-family development along Aurora Avenue, and substantial future development would affect population forecasts and sewering needs.

Planning Area Issues and Problems

Several capacity issues have been identified at the Hidden Lake Pump Station and in the downstream conveyance system. The capacity of the pump station and influent line is insufficient for wet weather conditions. Overflows at the pump station occur more than once per year. Utilizing storage along the overflow line and at Shoreline Pump Station No. 4 controls approximately 20 percent of the overflows at the Hidden Lake Pump Station. However the remainder of the overflows result in discharges directly to Puget Sound. A more pressing concern is the downstream conveyance capacity of the system. The pipeline between Hidden Lake and Richmond Beach is storm impacted more frequently than the pump station itself. In addition to backups, corrosion and odor control have been a problem along the pipeline and at the Hidden Lake Pump Station. The following list briefly summarizes specific areas of concern in the Hidden Lake Service Area:

1. The limited capacity of the Boeing Creek Trunk and the Hidden Lake pump station has created backups upstream of the pump station. In response to repeated flooding, a number of residences were disconnected from the Boeing Creek Trunk and connected to a sewer leading to Shoreline Pump Station No.5. Affected King County WTD manholes include B00-39 to B00-42. The January 1, 1997 storm caused a washout at the interconnection of the Shoreline WMD sewers and the Boeing Creek Trunk. While repairing coincident damage from this storm, the Shoreline WMD replaced approximately 185 feet of 15-inch diameter Boeing Creek Trunk pipe with 24-inch diameter concrete pipe.

2. Two Shoreline pump stations (No.4, No. 5) transfer wastewater to the Hidden Lake PS. When both Shoreline pump stations are in operation, the flow volumes are sufficient to stress the Hidden Lake Pump Station capacity, regardless of the quantity of influent from the Boeing Creek Trunk. There has been some concern about the large quantities of infiltration and inflow (I/I) originating in the Highlands SD.

3. Sulfide-related corrosion and odor have been an on-going problem at the Hidden Lake Pump Station and in the downstream piping. The wetwell was relined because of heavy corrosion and temporary odor control equipment is being installed. Corrosion was observed in the downstream piping approximately 10 years ago. At the time, the sections most heavily affected were sliplined. Additional rehabilitation is being performed on previously untreated pipe. The detention times in force main are

generally short. It is suspected that the high rate of corrosion may be due to some high-sulfide sources among the businesses on Aurora Avenue.

4. The process of sliplining has reduced the hydraulic capacity of the system, resulting in an increase in the frequency and severity of storm impacts. Limited downstream conveyance capacity has led to surcharging and/or overflowing manholes and backups into the Shoreline WMD gravity sewers. There are particularly severe storm impacts at the forebay to the siphon located along 14th Avenue NW (manhole BOO-29). Other manholes experiencing hydraulic problems are BOO-22, BOO-8, BOO-4, BOO-3 and BOO-2. The downstream conveyance capacity limitations are so severe that all three pumps in the Hidden Lake Pump Station cannot be operated simultaneously even when overflows are imminent.

PLANNING RECORDS REVIEW

1958 Plan

At the time of the 1958 Plan, the Ronald Sewer District had been formed (in 1951) and financed, with sewer plans in preparation. The original service area was 1.5 sq. mi. A system had also been built at the proposed Boeing Shopping Center (Aurora Avenue and 160th Street) but was not yet operating. The Boeing Shopping Center system had a service area of 0.03 sq. mi. and a capacity of 0.18 mgd. The Highlands private sewer system served a residential neighborhood of 0.7 sq. mi., discharging directly into Puget Sound.

Related Plans by Others

The following list summarizes, in chronological order, the available plans published since 1958:

1. Infiltration/Inflow Analysis for Hidden Lake Pump Station Standby Generator, March 1974.

2. 30th Avenue NE/Hidden Lake Pumping Stations Standby Generators Operation and Maintenance Manuals, December 1979.

3. Final Plan for Secondary Treatment Facilities, Volume II, November 1985.

4. Facilities and Service Area Status Report, January 1987.

5. Richmond Beach Treatment Plant Secondary Treatment Facilities, Predesign Report, May 1987.

6. Richmond Beach Treatment Plant Flow Transfer Project, Facilities Plan Final Predesign Report, April 1988.

7. Richmond Beach Treatment Plant Flow Transfer Project, Amendment to the 1987 Richmond Beach Facilities Plan, Final Predesign Report, July 1988.

8. Offsite Facilities Manual (1985) Revision A, March 1990.

9. Ronald Sewer District Comprehensive Sewer Plan, June 1990.

10. Hidden Lake Pump Station Operations and Maintenance Manual, November 1994.

11. Offsite Facilities and Miscellaneous Structures Manual, Volume 2 West Division, December 1994.

12. Shoreline Wastewater Management District Amendment to the 1990 Comprehensive Sewer Plan, 1995

13. Shoreline Wastewater Management District Infiltration/Inflow Program Phase II Report – Basins 1 and 2, January 1997.

14. Regional Wastewater Services Plan: Executive's Preferred Plan, Draft EIS, Final EIS, Draft Financing Plan, Draft Plan (5 Volumes), April 1998.

15. Preliminary Report on Infiltration/Inflow in the Shoreline Wastewater Management District, Basin 14, expected early 1999.

Differences from Original Service Area

Over the past 40 years, the boundaries and sewering services provided in the Hidden Lake Service Area have expanded. Originally, the only operating sewers were located in the private community known as the Highlands. These flows were discharged directly to Puget Sound without treatment. Today, the entire service area is sewered, and a number local agency and King County owned pump stations help transfer wastewater through the system to the Richmond Beach Pump Station and the Edmonds Treatment Plant.

The following list highlights changes to the service area and facilities since the 1958 Plan:

1962/63 Hidden Lake Pump Station and Sewers: The Hidden Lake Pump Station was completed in July 1962. As-built drawings dated January 1963 show the Boeing Creek Trunk extended from NW 176th St and 6th Ave NW (above pump station) to the Richmond Beach Lift Station (Richmond Beach Drive and 195th Place).

1971 Overflow Line Rerouting: The Hidden Lake Pump Station overflow line was modified to run towards what is now Shoreline Pump Station #4.

1974 Infiltration/Inflow Analysis for Hidden Lake Pump Station Standby Generator: The Hidden Lake Service Area had grown to approximately 2.6 mi2 (1,600 ac). Ronald Sewer District Pump Stations No. 4 and No. 5 had been built. The Highlands neighborhood sewers had been connected to the Ronald Sewer District system, discharging

to Pump Station #5. The boundaries stretched from 145th Street to the south and Puget Sound on the west to Aurora Avenue on the east and 203rd Street to the north. The northern and western boundaries were irregularly shaped. The reported population was 7,785. Sizable I/I inputs were observed from the sub-basin located along Aurora Avenue, and from the Highlands Sewer District.

1978 Standby Generator Installed: O&M manual gave Hidden Lake Pump Station drainage area as 2.9 mi^2 (1,850 ac).

1987-1990 Richmond Beach Flow Transfer Project: During the predesign phase of the Richmond Beach Treatment Plant Secondary Treatment Facilities, citizen concerns prompted King County to consider replacing the Richmond Beach TP with a pump station to transfer flows to Edmonds for treatment. The pump station was built at the site of the treatment plant, which was subsequently removed.

1991 Sliplining of Boeing Creek Trunk: Sections of the Boeing Creek Trunk with advanced sulfide-related corrosion were sliplined. See Task 220 – Figure 2 for locations of sliplined pipes. Reduced flow capacity in these sections has been observed.

1990 Ronald Sewer District Comprehensive Sewer Plan: The need for rehabilitation and/or expansion of the existing sewerage facilities was assessed based on population and land use forecasts. It was determined that no additional sewer construction was necessary, however a number of capital improvement projects were suggested. Within the Hidden Lake Service area, these projects include safety improvements to Pump Station No. 5 and the establishment of an Infiltration/Inflow analysis program.

1995 Shoreline Wastewater Management District Amendment to the 1990 Comprehensive Sewer Plan: Updated capital improvement planning information.

REGIONAL WASTEWATER SERVICES PLAN COORDINATION ISSUES

The Hidden Lake Pump Station only handles wastewater generated inside the Hidden Lake Service Area boundary. Currently this wastewater is pumped to the Richmond Beach Pump Station and then transferred to the Edmonds Treatment Plant. The preferred strategy in the current Regional Wastewater Services Plan (RWSP) calls for the construction of a wastewater treatment plant somewhere in northern King County or southern Snohomish County. It is not currently anticipated that potential rerouting in the King County conveyance system will affect the Hidden Lake Pump Station influent. Depending on the siting of the North Treatment Plant and potential changes to King County's flow exchange program with the city of Edmonds, there could be changes to the conveyance facilities downstream of the Hidden Lake Service Area. Unless the Hidden Lake Pump Station force main is directed away from the Richmond Beach Pump Station, these changes should have no effect on the conveyance capacity and needs of the service area.

GROWTH MANAGEMENT IMPACTS

The Hidden Lake Service Area is primarily comprised of single family residential units. Most properties are zoned RS-7200 or RS-15000 . The service area is approximately 100 percent sewered and is presently experiencing slow growth (less than percent annually). Without changes to the present zoning restrictions, there is little room for further growth for most of the service area. There is some potential some multi-family development along Aurora Avenue. The gravity sewered sub-basins upstream of the Hidden Lake Pump Station have enough excess capacity to handle modest growth. However, any growth within the service area will increase the loadings on the system at the Hidden Lake Pump Station and the Boeing Creek Trunk.